DOCUMENT RESUME

ED 136 105 CG 011 132

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TITLE Increasing Creative Writing: Predicting the Unpredictable.
PUB DATE [76]
NOTE 13p.; Paper presented at the Annual Convention of the American Psychological Association (84th, Washington, D.C., September 3-7, 1976)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS *Behavior Change; College Students; Composition (Literary); Creative Writing; *Creativity Research; *Divergent Thinking; Figurative Language; Higher Education; Imagination; *Performance Factors; *Positive Reinforcement; Research Projects

ABSTRACT

This paper reviews earlier experiments in fostering creative expression in the writing of students at all educational levels, and presents an abstract of an experiment involving 81 students of educational psychology at Tennessee State University. Each wrote one essay per week, which was then rated for creativity on four scales (fluency, flexibility, elaboration, originality) by six judges. Subjects were divided into three groups, each receiving a different kind of reinforcement: (1) Group 1 subjects received points according to each subject's performance on each essay; (2) Group 2 received points as a group according to group's cumulative performance on each essay; (3) Group 3 subjects each received a fixed number of points regardless of scores on essays. Results were analyzed by a one-way analysis of covariance and the Scheffe' S multiple comparison technique. Examination of the results showed that: (1) both contingent reinforcement groups were significantly superior in terms of all four mesures of creative ability to the non-contingent group; and (2) there was a significant difference between the group-shared reinforcement section and the individual reinforcement section, with the group sharing section being superior. Both contingent reinforcement groups showed dramatic increases in all four measures of creative responding over baseline (five weeks baseline, 11 weeks treatment). (Author/MPB)

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Increasing Creative Writing: Predicting the Unpredictable

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Creative ability, the act of creation and creativity all have been used to refer to a particular kind of behavior that educators and psychologists have been greatly interested in since the inception of something we might call teaching. How is it that some individuals are able to see new relationships between familiar things and others do not? How is it that one person develops new products or new uses for old products in highly inventive ways while others do not? How can we cause our students to be more likely to "think creatively"? These are the kinds of questions that research in creativity have tried to answer.

Most of the research and writing done on the topic of creativity has been done by educators and psychologists that could not be characterized as operant or behavioristically oriented persons. Behavioristically oriented people, of course, also wonder how to make their students behave in ways that could be labeled creative. Perhaps the first effort in this area by behaviorists was by Maltzman, Bogartz and Bregar (1958) wherein they demonstrated that pairing instructions to be verbally novel with contingent reinforcement of verbal novelty among college-age students significantly increased levels of novelty. The first successful attempt to predict unpredictability had been made. Maltzman, Simon, Raskin and Licht (1960) replicated the earlier study, varying reinforcement under five conditions with similar results. Evidentally a

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a combination of directions to be "novel" (different, unpredictable or unusual) paired with reinforcement for unpredictable responses would result in a series of predictable unpredictable responses. The prediction could be made that responses of an unpredictable nature could be brought under experimental control.

By 1970, a great amount of progress had been made by the developers and writers of programmed learning materials, a form of managing the contingencies of behaviors so that some responses would be strengthened automatically as the student progressed through the material while other behaviors would be extinguished. Utilizing the newest methods in programmed instruction, Reese and Parnes (1971) demonstrated that students' scores on creativity tests could be significantly enhanced through the use of programmed materials designed to enhance problem solving skills.

The kinds of operational definitions that had appeared so far weighed very heavily the definition of novel (creative) behaviors as those that were unexpected or those that could be measured by existing tests of creative ability. Goetz and Baer (1972, 1973) developed much more precise behavioral specifications of components of creative responding. They then demonstrated that the diversity of blockbuilding forms among preschool children could be greatly enhanced by reinforcing individual production of new blockbuilding forms. By reinforcing the appearance of new (unpredictable) forms of

block structures, they brought the appearance of still more new (unpredictable) blockbuilding forms under experimental control. They, too, were able to predict the appearance of unpredictable behaviors. Similarly, Goetz and Salmonson (1972) demonstrated that the number of painting forms used by children could also be increased through the use of descriptive reinforcement. Again, the reinforcement of a new behavior resulted in an increase in the number of new forms appearing overall.

Meanwhile, Pryor (1969) reinforced the novel behaviors of a porpoise over a series of several sessions. The animal in question had been through several operant conditioning sessions prior to this study. After several trial periods, the animal began to emit large numbers of novel responses that had never been observed in its behavioral repertoire. The porpoise eventually ceased to emit novel responses but not before it was evident that reinforcing novel (unpredictable) behaviors would cause an increase in the total numbers of unpredictable behaviors. The fact that the novel behaviors ceased to appear may be interpreted in many ways (the form of reinforcement may have stopped being potent, the porpose may have only had a very limited number of possible novel behaviors it could emit, etc.).

The overall approach to the behavioral analysis of creativity had so far been outside the realm of classroom management techniques, that one area we would want to have the

greatest amount of possible transfer of research results. Maloney and Hopkins (1973) moved into the classroom and showed that reinforcement of certain aspects of student writing behavior, operationally defined as creative, increased subjective impressions of the levels of creativity evidenced in the students' writing. The prediction of the unpredictable had moved into the classroom. Glover and Gary (1976) applied instructions, reinforcement and practice to four behaviorally defined components of creative behaviors to eight fourth and fifth grade students. All four components (fluency, the number of different responses; flexibility, the number of different verb forms; elaboration, the mean number of words per response; and originality, the statistical infrequency of response forms) were demonstrated to be under experimental control. The students also showed statistically significant gains in scores on Torrance's tests of creativity.

Still within the classroom setting, Glover and Sautter (1976) applied verbal instructions, practice and reinforcement to four operationally defined components of creative behaviors of 26 high school students within their written work in an elective class. All four components (fluency, the number of approaches to the topic; flexibility, the number of different kinds of approaches to the topic; elaboration, the number of words per approach to the topic; and originality, the statistical infrequency of an approach to a topic) were demonstrated to be under experimental control. Subjective impressions of the levels of creativity evidenced in the

students' writing also increased greatly.

The studies summarized (certainly not an all inclusive summary) above provide a brief sketch of how the operant approach to modifying creative behaviors has progressed over the last several years. In each instance the authors warn that the behaviors they have modified (i.e., enhanced) may or may not, in fact be creative. Increasing sheer numbers of responses (quantity) is no guarantee that the quality of the responses has also become greater; more creative. When persons are caused to respond more often, in more different ways, in more elaborate ways, and in ways that are statistically infrequent, then this is exactly what they have done. That is, they have behaved in ways that are operationally defined as creative ways of behaving. Whether, in fact, creativity has been enhanced depends on exactly how one defines the notion of creativity in the first place. However, any survey of the literature in the area of creativity (admittedly suffering from severe problems in actually behaviorally specifying what is talked about) verfies that the component of novelty (statistical infrequency, unusualness, unexpectnedss, etc.) is a component that all writers and researchers in this area agree as being the major component of creativity. Here, for the time being setting aside any other possible components of creativity, lies the major problem for those of us interested in predicting behaviors. Is there a logical absurdity in attempting to predict what has been agreed upon as unpredictable?

It seems readily apparent after a brief review of the literature that this is what happens when reinforcement is made contingent on the appearance of new or statistically infrequent behaviors. Do such behaviors fall into a class of behaviors that are, of necessity a dead-end, e.g., "behaviors I can perform but those I only think about and never do"? The Pryor (1969) results and the Glover and Sautter (1976) results would seem to support such an hypothesis, that is, that only a limited number of such responses exist within an organism's repertoire and that all we have done is to cause them to appear until they are exhausted rather than having developed some response that really wasn't there at the start of our procedure. An equally plausible explanation is that a new approach to a particular series of discriminative stimuli has been shaped and that this approach will continually result in behaviors that have never before appeared in the organism's repertoire of behaviors either because it has not had reason to perform an already formed behavior or by "inventing" by way of the learned approach to the setting a new behavior that just did not exist before but that is made up of bits and peices of already learned behaviors. The second explanation should lead to the possibility of an infinite number of possible statistically infrequent behaviors. Which of these two hypotheses is closest to what really is happening remains to be determined. A third possible hypothesis, one that is highly similar to the second described above is that we are reinforcing a poorly defined method of attacking a

problem. This would be roughly analogous to teaching people how to use the scientific method in problem solving. In that case people learn a pattern of behavior that is then generalized to new problem situations. It may be, naturally, that none of the hypotheses are even close to correct and some other explanation must be developed. In any event, it is apparent that the "quality" of responses has not yet received attention with current work directed at the quantity of responses.

Novel behaviors must come from sonewhere. The bias that operantly oriented persons have would lead us to the hypothesis that a novel behavior must be emitted because some process has been learned by the organism that causes it to piece together bits of other previously learned behaviors and to emit this new combination of responses, in effect performing a behavior (a new combination or recombination of old responses) that appears to the observer to be statistically infrequent (new) with respect to that organism's previous history of behavior. It must be this process of combining bits and pieces of old behaviors to form a new behavior that we would call novel responding, perhaps the major component of creativity. We are not getting something for nothing-new behaviors do no form out of thin air because reinforcement is now contingent on new behavior. Rather, reinforcement must be perceived by the organism as being contingent on the rearrangement of old responses into new behaviors. If this is not what we

are bringing under experimental control, regardless of how such a process might work, then some of our basic assumptions about behavior must be re-examined.

The other components of creativity that have been demonstrated to be under experimental control, fluency, flexibility, elaboration, and synonomous terms are more clearly understood as they refer to easily definable kinds of behaviors. That they are related to creativity can only be taken as an assumption from the non-operant works on creativity that repeatedly mention such kinds of response measures. Whether they are, in fact, a part of creative responding is also debateable and not likely to be resolved until there is some consensus within the field as to what behaviors constitute creativity. Even if they are accepted by consensus validation it will still be necessary for some distinctions to be made by the quality of the responses and not just the quantity as has so far been the case.

Before briefly outlining our most recent investigation into enhancing the levels of creativity within student's writing, one speculation will be brought forward. The study of creative behaviors may necessitate a return to examining behavior in terms of molarity and molecularity much in the manner as was Tolman's general approach to behavior. It would seem that two levels of analysis would be necessary to understand the creative process, the molar which has been thoroughly investigated and the

molecular.

An Abstract of Creative writing research.

The present study was designed to explore the effects of three types of environmental manipulation on the creative performances of individual students within their written work. Primary questions to be answered were (1) would the implementaion of individual or group-shared reinforcement contingencies prove to be superior to non-contingent reinforcement and (2) would there be any difference in the levels of creative responding between the individual reinforcement and the group-sharing reinforcement sections.

Method

Three sections of Educational Psychology 242 at Tennessee State University were selected for the study. Each of the eight-one students involved was required to write an essay each week through the sixteen week Spring semester dealing with some issue that was a part of the current course content. Topics were assigned the total group on a weekly basis. Each of these papers was rated for levels of creativity (fluency, flexibility, elaboration, originality) by six judges, each rating all the four variables independently. All the judges were graduate students in psychology. Satisfactory ihter-judge reliabilities were achieved before the experiment began ($\underline{r}$ = .94 for fluency; $\underline{r}$ = .88 for flexibility; $\underline{r}$ = .96 for elaboration; r = .71 for originality). Thereafter, reliabilities were computed weekly for all judges, with reliabilities exceeding .85 for the first three variables and .68 for originality in each instance.

The conditions were (1) individual reinforcement (holding extra points toward the course grade solely contingent on individual performance with fluency, flexibility, elaboration and originality lumped together for the purposes of computing the number of extra points but reporting each measure separatly to the students), (2) group reinforcement sharing (assigning extra points daily to the entire group based on the creativity rating of each individual's performance, and (3) non-contingent reinforcement, with a standard number of extra points given each person regardless of the creativity scores which were still reported to each student.

Results

Results were analyzed by a one-way analysis of covariance and the Scheffe' S multiple comparison technique. Examination of the results showed that: (1) both contingent reinforcement groups were significantly superior in terms of all four mesures of creative ability to the non-contingent group; and (2) there was a significant difference between the group-shared reinforcement section and the individual reinforcement section, with the group-sharing section being superior. Both contingent reinforcement groups showed dramatic increases in all four measures of creative responding over baseline (five weeks baseline, 11 weeks treatment).

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